

REMARKS/ARGUMENTS

Favorable reconsideration and allowance of the present application are respectfully requested in view of the following remarks.

Claims 11-15, 25-28 and 30-43 were pending prior to the Office Action. In this Amendment, claims 44-47 are added. Therefore, claims 11-15, 25-28 and 30-47 are pending, of which claims 11 and 12 are independent.

Claims 11 and 12 are amended for clarification.

A. OBJECTION TO THE CLAIMS

Examiner objects to claim 36 for allegedly failing to further limit the subject matter of a previous claim. *Office Action, p.2, item 1.* In particular, the Examiner alleges that the features of “an intermediate layer formed on the first photoelectric conversion layer” and “a second photoelectric conversion layer formed on the intermediate layer” are already present in claim 11.

Applicants respectfully disagree. Independent claim 11 requires a photoelectric conversion layer stacked above a structure and a backside electrode layer stacked above the photoelectric conversion layer. Claim 11 does not require an additional photoelectric conversion layer and does not require an intermediate layer form on one of the photoelectric conversion layers.

Applicants respectfully request that the objection be withdrawn.

B. § 112, 2ND PARAGRAPH REJECTION

Claims 11-15, 25-28 and 30-43 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. *Office Action, p.3, item 3.* The Examiner expresses that the feature of “wherein the opening portion does not electrically separate the transparent electrode layer” is unclear.

This feature was first introduced in the Amendment submitted on June 3, 2010 as claim 29. In the Office Action dated October 14, 2010, there were no expressions of confusion of this feature. Instead, the Examiner relied upon Sato (EP 1443527) to allegedly teach this feature.

Regardless, to promote the progress of the application in an attempt to enhance clarity, independent claim 11 is amended to recite “wherein the opening portion does not separate the transparent electrode layer.” Independent claim 12 is similarly amended.

Applicants respectfully request that the objection be withdrawn.

C. §102 REJECTION - KUWANO

Claims 11, 12, 25-27, 30 and 36 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Kuwano et al. (U.S. Patent No. 4,281,208, *hereinafter Kuwano*). Applicants respectfully traverse.

A non-limiting aspect of the present disclosure is directed to a stacked photoelectric conversion device, which can attain a high photocurrent and high photoelectric conversion efficiency. A structure of a superstrate type thin film

solar cell includes a transparent conductive layer, a photoelectric conversion layer and a backside electrode layer stacked in this order on a transparent substrate. *Original disclosure, pp.1-2, [0001-0003].*

In a thin film solar cell, making effective use of light entering the semiconductor layer is important. One way to achieve this is through an optical confinement technique. To improve optical confinement, the transparent layer should have high transmittance and should effectively scatter or refract incident light. Haze index can be used as an evaluation characteristic to measure the scattering/refracting capability of the transparent conductive layer. Higher index indicates higher capability. Haze index can be increased by having a surface texture structure in which level differences between projections and depressions of the texture is large. In addition to the optical confinement, it is also important to minimize electrical sheet resistance. *Original disclosure, pp.2-3, [0003-0005].*

Conventional solar cells are unable to achieve both high transmittance and high haze index simultaneously. To achieve high transmittance, the thickness of the transparent conductive layer can be reduced. But doing so leads to an increase in the sheet resistance, and thus to an increase in the series resistance loss. Therefore, the photoelectric conversion efficiency of a photoelectric conversion device decreases as the thickness of the transparent conductive layer decreases. Further, when the film thickness is reduced, haze

index is decreased since the level difference between projections and depressions in the texture is decreased. *Original disclosure, p.6, [0010].*

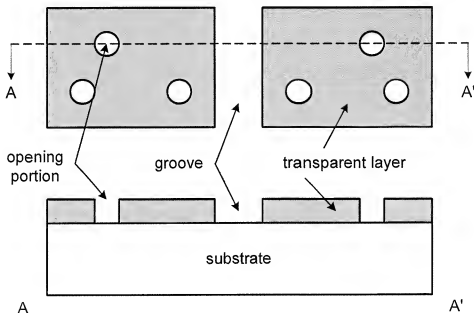
Conversely, to achieve high haze index, the thickness can be increased so that the level difference between the projections and depressions can be made larger. But, the quantity of light absorbed in the transparent conductive layer increases when the thickness increases, and therefore the transmittance is reduced and the photoelectric conversion efficiency is again decreased. *Original disclosure, p.7, [0011].*

A non-limiting embodiment of a photoelectric conversion device, an example of which is illustrated in Figure 3 of the original disclosure, addresses one or more problems of conventional devices. The photoelectric conversion device 31 comprises, stacked in order, a transparent substrate 3, a transparent conductive layer 5, a photoelectric conversion layer 13 and a backside electrode layer 15. The photoelectric conversion layer 13 comprises, stacked in order, a p-type semiconductor layer 13a, an i-type semiconductor layer 13b and an n-type semiconductor layer 13c. The backside electrode layer 15 comprises, stacked in order, a backside transparent conductive layer 15a and a conductive layer 15b. *Original disclosure, p.49, [0112].*

Figure 1 of the original disclosure illustrates the combination structure of the transparent substrate 3 and the transparent conductive layer 5. As seen, the transparent conductive layer 5 is formed on at least a part of the surface region of the transparent substrate 3. The transparent conductive

layer 5 has at least an opening portion 7 that exposes the transparent substrate 3. The transparent conductive layer 5 also has a texture structure 9 on its surface. *Original disclosure, p.47, [0106].*

Regarding the opening portion of the transparent conductive layer, the original disclosure states "... opening portion does not include a groove for separating a transparent electrode provided for forming an integrated structure in which a plurality of photoelectric conversion cells are electrically connected in series on an insulating substrate ..." *Original disclosure, pp.16-17, [0031].* For explanation purposes, the following figure is presented.



In the explanatory figure, there are two separate transparent conductive layers. The circles in both left and right transparent conductive layers represent opening portions. Note that none of the circles in either the left or the right transparent conductive layer can separate the respective transparent

conductive layer. However, the groove does separate the left transparent conductive layer from the right transparent conductive layer. Thus, the circles would be examples of opening portions, but the groove would not be.

This is reflected in independent claim 11 which recites, in part “wherein the opening portion does not separate the transparent electrode layer.” Kuwano does not teach or suggest this feature.

In the Office Action, referring to Figs. 4, 5 and 6 of Kuwano, the Examiner alleges that the transparent electrodes 91, 92 and 93 are equivalent to the claimed transparent conductive layer. However, the transparent electrodes 91, 92 and 93 are all separate – they are separated from each other by grooves. Fig. 2 clearly shows that the photoelectric converting regions 81, 82 and 83 which correspond to the placements of the transparent electrodes 91, 92 and 93 are all separated. Fig. 7B shows even more clearly that the transparent electrodes 91, 92 and 93 are all separated by grooves.

There are no opening portions as recited in any of the individual transparent electrodes. This is sufficient to distinguish claim 11 from Kuwano. Claims 25-27, 30 and 36 are distinguishable over Kuwano by virtue of their dependencies from independent claim 11 as well as on their own merits.

Independent claim 12 recites, in part “wherein the opening portion does not separate the first transparent electrode layer.” As discussed above, Kuwano does not teach or suggest this feature. This is sufficient to distinguish claim 12 from Kuwano.

But in addition, claim 12 recites “a first photoelectric conversion layer stacked above a structure”, “a first intermediate layer stacked above the first photoelectric conversion layer,” and “a second photoelectric conversion layer stacked above the first intermediate layer such that the first intermediate layer is sandwiched between the first and second photoelectric conversion layers.”

Kuwano does not teach or suggest these features. Kuwano indicates that an amorphous silicon layer 10 is formed above the transparent electrodes 91, 92 and 93, and the second electrodes 111, 112 and 113 are formed above the amorphous silicon layer 10 so as to sandwich the amorphous silicon layer 10 between the transparent electrodes 91, 92 and 93 and the second electrodes 111, 112 and 113. The amorphous layer is made up a P type layer 13, an intrinsic layer 14 and an N type layer 15. *Kuwano, c.4, l.26 – c.5, l.6.*

In the Office Action, the Examiner alleges that Kuwano's P type layer 13, intrinsic layer 14 and the N type layer 15 are equivalent to the claimed first photoelectric conversion layer, the first intermediate layer and the second photoelectric conversion layer. Such interpretation is unreasonable.

Applicants recognize that the claims are to be given their broadest reasonable interpretation. However, it is also well-established that the broadest reasonable interpretation of the claims must be consistent with the interpretation that those skilled in the art would reach. *MPEP 2111*. The words of a claim must be given their plain meaning, where plain meaning refers

to the ordinary and customary meaning given to the term by those of ordinary skilled in the art. *MPEP 2111.01*.

In this instance, one of ordinary skill would realize that photoelectric conversion occurs due to the combination of P, I, and N layers. Thus, considering the amorphous layer 10 as being a photoelectric conversion layer would be consistent with interpretation that one of ordinary would reach.

However, one of ordinary skill in the art would not interpret the P type layer 13 and the N type layer 15 of the amorphous layer 10 to be two different photoelectric conversion layers as the Examiner has done. Simply put, the Examiner's interpretation is inconsistent with the ordinary and customary meaning of "photoelectric conversion layer." that would be given by those of ordinary skill in the art. Thus, the Examiner's interpretation is unreasonable.

When ordinary and customary meaning are given, Kuwano does not disclose first and second photoelectric conductive layers with an intermediate layer therebetween. At least for the above stated reasons, claim 12 is distinguishable over Kuwano.

Applicants respectfully request that the §102 rejection based on Kuwano be withdrawn.

D. §102 REJECTION - SATO

Claims 11, 12, 25-27, 30, 31, 35 and 36 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Sato et al. (EP 1443527, *hereinafter Sato*). Applicants respectfully traverse.

The Examiner relies upon Figs. 1 and 5 of Sato to allegedly disclose the features of claim 11. Fig. 1 illustrates a substrate 1 and a transparent conductive oxide (TCO) film formed thereon. *Sato*, [0018]. The substrate is covered by discontinuous small ridges 4 made of a first oxide, and a continuous layer 5 made of a second oxide. *Sato*, [0033]-[0035].

In the Office Action, the Examiner alleges that the discontinuous small ridges 4 are equivalent to the claimed transparent electrode layer. However, the small ridges 4 are explicitly recited to be “discontinuous”. *Sato*, [0035]. That is, each small ridge 4 is, even under the Examiner’s interpretation, separate from other small ridges 4. None of the small ridges 4 themselves contain any opening portions therein. The feature of “wherein the opening portion does not separate the transparent electrode layer” cannot be shown by the discontinuous small ridges 4. It then naturally follows that Sato cannot teach or suggest the feature of “wherein the opening portion is not covered by the transparent electrode layer.”

For at least the above stated reasons, independent claim 11 is distinguishable over Sato. Claims 25-27, 30, 31, 35 and 36 are distinguishable

over Sato by virtue of their dependencies from claim 11 as well as on their own merits.

Independent claim 12 recites, in part “wherein the opening portion does not separate the first transparent electrode layer” and “wherein the opening portion is not covered by the first transparent electrode layer.” As demonstrated, Kuwano does not teach or suggest these features.

Applicants respectfully request that the §102 rejection based on Sato be withdrawn.

E. §103 REJECTION - SATO

Claims 28 and 32-34 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Sato. Applicants respectfully traverse.

These claims depend from independent claim 11 directly or indirectly. Therefore, claims 28 and 32-34 are also distinguishable over Sato by virtue of their dependencies from independent claim 11 as well as on their own merits.

Applicants respectfully request that the §103 rejection based on Sato be withdrawn.

F. §103 REJECTION – SUZUKI, SATO

Claims 11-15, 25 and 36-43 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Suzuki et al. (U.S. Patent No. 5,350,459, *hereinafter Suzuki*) in view of Sato. Applicants respectfully traverse.

The Examiner admits that Suzuki does not disclose the transparent electrode layer as recited in claim 1, but alleges that Suzuki's deficiency can be corrected through Sato. But as demonstrated above, Sato is deficient. For at least this reason, independent claims 11 and 12 are distinguishable over Suzuki and Sato.

The Examiner also alleges that Suzuki teaches a plurality of conversion layers. In actuality, Suzuki teaches a single photoelectric conversion layer composed of first and second electron acceptor organic layers EAOL (I) and (II), and first and second electron donor organic layers EDOL (I), and (II). *Suzuki, column 6, lines 12-17; Figs. 1 and 2.* Suzuki is explicit that the electric charges "are generated at the interface between the second electron acceptor organic layer EAOL (II) and the first electron donor organic layer EDOL (I)." *Suzuki, column 6, lines 17-21.* Simply put, the entirety of the organic layers EAOL (I), EAOL (II), EDOL (I) and EDOL (II) form a single photovoltaic layer. This is in complete contrast to claim 12 which recites first and second photoelectric conversion layers.

For at least the above stated reasons, claims 11 and 12 are distinguishable over the combination of Suzuki and Sato. Claims 12-15, 25 and 36-43 are distinguishable over Suzuki and Sato by virtue of their dependencies from independent claims.

The dependent claims are also distinguishable on their own merits. For example, claims 13 and 14 both recite "wherein the first intermediate layer has

at least an opening portion within which the first intermediate layer is absent.” The Examiner alleges that the pin holes described in column 6 and in column 40 are equivalent to the claimed opening portion of the first intermediate layer. As demonstrated above, the EAOL (II) layer is part of the single photoelectric conversion layer in Suzuki. Suzuki does not disclose any layers resembling the claimed intermediate layer.

For at least the reasons stated above, Applicants respectfully request that the rejections of claims based on Suzuki and Sato be withdrawn.

G. NEW CLAIMS

Claims 44-47 are added. No new matter is presented. Support for claims 44 and 45 can be found in at least [0107] (*p.47, l.27 – p.48, l.16*) of the original disclosure. Support for claims 46 and 47 can be found in at least [0028] (*p.15, ll.14-29*) of the original disclosure.

Applicants submit that due to their dependencies from independent claims as well as on their own merits, the new claims are distinguishable over the cited references of record. Applicants respectfully request that the new claims be allowed.

H. CONCLUSION


All objections and rejections raised in the Office Action having been addressed, it is respectfully submitted that the present application is in

condition for allowance. Should there be any outstanding matters that need to be resolved, the Examiner is respectfully requested to contact Hyung Sohn (Reg. No. 44,346), to conduct an interview in an effort to expedite prosecution in connection with the present application.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Respectfully submitted,

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